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EXAMINER	
LIEW, ALEX KOK SOON	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/688,326	Applicant(s) WEISS ET AL.
	Examiner Alex Liew	Art Unit 2624

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 March 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

The amendment filed on March 27, 2007 is entered and made of record.

Response to Applicant's Arguments

The applicant argues 'Takayama attempts to save time by extracting both inspection and review information from images taken in one step.' However, Takayama (US pat no 6,674,889) performs detecting / inspecting for defects then sends the defect information to the review controller (see fig 8), without any interruption in the detection part (see col. 14 lines 1 – 11 – there is no interruption in inspection while current defect is being reviewed, then in the inspection process continues to find another possible defect), which reads on '... the first defects, wherein the reviewing of the first defect is performed concurrently with detecting of the second defect.' Also there is a suggestion in Takayama where it takes longer time to have to stop inspection process to review a defect and will have to stop the inspection process every time a defect is found, so review can be done to the defect (see col. 3 lines 12 – 27); the invention of Takayama is to alleviate the problem of stopping inspection for reviewing, by using real time defect detection and reviewing.

The combination of Bishop (US pat no 4,589,140) and Takayama ('889) discloses the claimed invention of claim 1.

All other arguments by the applicant are non-persuasive relating to all other dependent claims.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 3, 8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bishop ('140) in view of Takayama ('889):

With regards to claim 1, Bishop discloses a method for inspection of flat patterned media comprising:

- detecting a first defect of the flat patterned media through an imaging means using a relatively lower resolution imaging and positioning protocol (see fig 3 – D – the short circuit is imaged at lower magnification and is read as the first defect),
- detecting a second defect of the flat patterned media through an imaging means using a relatively lower resolution imaging and positioning protocol (see fig 3 – E – the pin hole is imaged at lower magnification and is read as the second defect) and
- reviewing, using imaging according to a relatively higher resolution imaging and positioning protocol for the first and second defects (see fig 3 – B and A, are imaged at higher magnification for the short and pin hole images, respectively).

But Bishop does not disclose operator observing the low and high magnification electronic part defect images concurrently. Bishop suggests observing both low and high magnification images of the electronic part defects at different times as shown in figure 4 (the object being inspect is move across a conveyor, at each section a camera with a greater magnification takes images of the defects present on the electronic part). Takayama discloses the first defects, wherein the reviewing of the first defect is performed concurrently with detecting of the second defect (see col. 14 lines 1 – 11 – there is no interruption in inspection while current defect is being reviewed, then in the inspection process continues to find another possible defect, which is read as the second defect).

It would have been obvious to one having ordinary skill in the art at the time of the invention was made to include observing the low and high magnification electronic part defect images concurrently because the system or the operator does not have to stop inspection process whenever a defect is found, the system can continue scanning for defect while being reviewed at the same time, to improve productivity (see col. 3 lines 28 – 36).

With regards to claim 3, see the rationale and rejection for claim 1. In addition, Bishop discloses assigning review worthiness values to said first defect, through a defect detection sub-system having a plurality of defect detection sub-system modules operative according to a first relatively lower operating resolution (see fig 2 showing a flat patterned media and lower resolution is shown in fig 9b low magnification FOV with

defect shown on the upper right corner – if the defect is worthy or if there is a present of defect in a particular area, then a higher resolution image of the defect is taken) and classifying first defect (see fig 3 – B – the defect is classified as a short).

With regards to claim 8, Bishop discloses a method according to claim 3 comprising

- generating in the defects detection sub-detection sub-system, a sequence of defect candidates (see fig 2 shows a series of defects in sections A – E and magnified in fig 3 being a pinhole, short, normal, short and pinhole, respectively),
- queuing and scheduling the sequence for imaging by a plurality of the defect review sub-system modules (see fig 3 the defects are sequenced in alphabetic order from A through E and review as being classified as pinhole, short, normal, short and pinhole, respectively),
- dispatching the defect review sub-system modules to perform relatively higher resolution imaging of outstanding defect candidates to create a sequence of defect candidates associated with the relatively higher resolution image data (see fig 3 shows all magnified defects in the flat patterned in fig 2),
- causing the defects candidates to experience a two stage processing involving: an automatic review process and automatic classification process (see col. 4 lines 21 – 32 – the flat patterned in fig 2 is first scanned completely and the process goes back for review for each defects in a higher resolution, classification is shown in fig 3 at higher resolution as pinhole, short and normal),

- during the automatic review process, comparing the high resolution candidate image with a reference image stored in system memory of known defects status (see fig 11i – recognition memory – pattern information used to characterize object in run mode, objects as in defects), wherein the comparing comprises compensating for known variations between test and reference including correcting for at least one of the following:
- imaging instrument sensitivities and sensor pixel sensitivity variations (see fig 4 – shows different level of magnifications at 5x, 10x and 20x, each magnification represent a sensitivity and each magnification represent a resolution),

conveying information on legitimate defects to for automatic classification processing thereafter

- during automatic classification processing, using the relatively higher resolution defects image in combination with output of the automatic classification processing to extract relevant features of the defect (see fig 3 – shows defects shown at higher resolution) and
- making final decision on type of the defect through the classification processing (see fig 3 – shows the type of defects, pinhole and short).

But Bishop does not explicitly discloses compensating for spatial miss assignment at sensor pixel level to result in either the validation of the existence of a legitimate defect at the candidate location or rejection of the defect as a false defect including an artifact of known limitations of the low resolution DDS sub-system. Bishop discloses eliminating the use of critical alignment and operates independently of slight rotation or

displacement of the object (see col. 19 lines 31 – 33), suggesting that it is well known in the art to compensate spatial misalignment by performing critical alignment by Bishop. Bishop solves the misalignment problem by using a learning system, to rotate the object at all orientations to measure noise at all levels obtaining a noise model (see col. 19 lines 34 – 44). It would have been obvious to one having ordinary skill in the art at the time of the invention was made to construct a noise model because, to compensate for any noise present in the object image to avoid any spatial misalignments to improve the imaging system. Further, the process of Bishop effectively compensates for any misalignment.

With regards to claim 11, see the rationale and rejection for claim 3.

3. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bishop ('140) and Takayama ('889) as applied to claim 3 further in view of Fukushima (US pat no 5,991,688).

With regards to claim 4, Bishop discloses all of the claim elements / features as discussed above in rejection for claim 3 and incorporated herein by reference, and a method according to claim 3 comprising maximizing the number of higher priority defect candidates captured by said defect review sub-system modules (see fig 3 – the defects are prioritized from image A to E), but fails to disclose minimizing distance travel by said defect review. However, Bishop discloses one would scan over the entire flat patterned

media and then later come back to examine candidate defect area using higher resolution (see col. 4 lines 24 – 33), which suggest it is best to find the shortest or minimum distance to the next candidate defect to save time. Fukushima discloses constructing a forward flow graph with nodes corresponding to current position of the vehicle and arcs corresponding to feasible motions from current position, for each arc signifying a module move from one node to another node (see fig 3 – the nodes located at R0 to R7 and the move start from R0 moving from one node to another sequentially, see also col. 10 lines 32 – 49 showing movements from R1 to R3, each node is read as a defect). It would have been obvious to one having ordinary skill in the art at the time of the invention was made to include a minimum distance calculation because to save time and processing power from the system while moving from one defects to another, to improve system performance.

With regards to claim 5, Bishop discloses all of the claim elements / features as discussed above in rejection for claim 3 and incorporated herein by reference, but fails to disclose constructing a forward flow graph means, solving resulting graph means and computing data means. However, Bishop discloses one would scan over the entire flat patterned media and then later come back to examine candidate defect area using higher resolution (see col. 4 lines 24 – 33 – as well as col. 3 lines 10 – 30; col. 5 lines 5 – 30). It is best to find the shortest distance to the next candidate defect to save time. Fukushima discloses constructing a forward flow graph with nodes corresponding to current position of the vehicle and arcs corresponding to feasible motions from current

position, for each arc signifying a module move from one node to another node (see fig 3 – the nodes located at R0 to R7 and the move start from R0 moving from one node to another sequentially, see also col. 10 lines 32 – 49 showing movements from R1 to R3), associating costs to arcs as a function of cost factors, including a cost of missing other nodes (see col. 12 lines 58 – 65 – starting from A the shortest route is from A to B, the link from A to C is next shortest route, C is the missing node because C is not use and becomes a missing node and shown in fig 5), distance of necessary motion (see also col. 10 lines 32 – 49 – calculating between each node, L, indicates as cost) and worthiness of a captured node to obtain a resulting graph (see fig 3 – all the nodes shown, R0 – R7, are worthy), solving the resulting graph for minimum cost path from the current location of the defect review sub-system module to the last node (see col. 10 lines 32 – 49 – Lmin is the objective minimum distance goal moving from node to node shown in fig 3) and computing motion data for the node for controlling motion (see col. 14 lines 56 – 57 – the vehicle will reach the destination node after link has been confirmed). See the motivation for rejection for claim 4. This will solve system from having to make a second pass over the object or from changing modes / magnification repeatedly at every potential defect.

4. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bishop ('140) and Takayama ('889) as applied to claim 3 further in view of Yaroslavsky (US pub no 2003/0118245).

With regards to claim 6, Bishop discloses all of the claim elements / features as discussed above in rejection for claim 3 and incorporated herein by reference and beginning at a pre-determine distance from a target candidate location and during the motion of the defect review sub-system module (see fig 3 – the images taken are sections A – E in fig 2, showing pinhole, short defects and normal), but fails to disclose automatically focusing the imaging element, focus quality measure means, interpolating sample means and z-axis maximum positioning means. Yaroslavsky discloses obtaining a focus quality measure computed over the images to sample a focus quality measure computed over the images to sample a focus quality measure computed over the images to sample a focus quality curve (see fig 1 – a set of images are create then for each image the edge density is computed and plotted on a graph in fig 2), interpolating the samples of the focus quality curve with a smoothing function to determine a maximizing focus point for a z-stage moving the focusing optics (see fig 2 – the sample are Fp1 and Fp2, and from those two or more samples the curve is created, indicating two maxima which have the highest edge density corresponding to their image in the set) and directing the z-stage to a the z-axis position which maximizes the said focus quality metric curve to achieve sharpest focus of the target candidate location (see fig 3 – finds the optimum focus position of the imaging sensor, optimum position shown in fig 2 Fp1 and Fp2, the sensor indicating the z-axis position, imager shown in fig 4 also see paragraph 4 middle of the paragraph and paragraph 5). The methods described in Yaroslavsky are to automatically find the best focus for each image by using focus level and edge density graph. It would have been obvious to one having ordinary skill in the

art at the time of the invention was made to include an auto-focusing system because to minimize the errors and variations during focusing on a image to produce the best images for inspection (see paragraph 4 – last 7 lines).

With regards to claim 7, Bishop discloses all of the claim elements / features as discussed above in rejection for claim 3 and incorporated herein by reference and capturing a sequence of image data from an imaging element of the defect review sub-system (see fig 3 – image A – E are the sequence of image captured), but fails to disclose using sequence of image data in combination with said focus quality measure computed over the images to sample the focus quality curve. Yaroslavsky discloses using sequence of image data in combination with said focus quality measure computed over the images to sample the focus quality curve (see fig 1 – step 110 create a set of images of the object then from the images a plot of focus position versus edge density is created). See the motivation for claim 6.

5. Claims 2, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bishop ('140) in view of Takayama ('889) and Yaroslavsky (US pub no 2003/0118245).

With regards to claim 2, 9 and 10, see the rejection for claims 1, 6 and 8. In addition, Yaroslavsky discloses using automatic focus imaging (see paragraph 5). One skill in the

art would include automatic focusing because to relieve strait on the photographer, so the photographer can focus on taking a more precise image of the electronic part.

6. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bishop ('140) and Takayama ('889) as applied to claim 11 further in view of Gilliland (US pat no 5,999,642).

With regards to claim 12, Bishop discloses all of the claim elements / features as discussed above in rejection for claim 11 and incorporated herein by reference, but fails to discloses defect detection system is mounted on a first moveable gantry. Gilliland discloses an apparatus according to claim 7, wherein the defect detection sub-system is mounted on a first moveable gantry and the defect review sub-system is mounted on a second movable gantry (see fig 1 – 12 first gantry moving along the A and A^{l} path and fig 1-12b second gantry moving along B and B^{l} path with a set of cameras, 16A and 16B), but does not the first and second does not move to together on the same axis. Takayama suggests that the reviewing section (see fig 1 – 4) and detecting section (see fig 1 – 5) must move with each other (see col. 6 lines 21 – 30) as the X-Y stage is move the optical devices 1 – 4 and 1 – 5 are always opposite position of each other. One skill in the art would want the reviewing and detecting section together because to use laser light to transmit light to the image pick sensor to produce a detail image for inspection.

It would have been obvious to one having ordinary skill in the art at the time of the invention was made to include a pair of gantry because to move along the horizontal and vertical to allow images of the object to be capture for inspection.

With regards to claim 13, see the rationale and rejection for claim 12.

7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bishop ('140) in view of Takayama ('889) and Gilliland (US pat no 5,999,642) as applied to claim 13 further in view of Fukushima ('688). See the rationale and rejection for claim 5.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alex Liew whose telephone number is (571)272-8623. The examiner can normally be reached on 9:30AM - 7:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Mancuso can be reached on (571)272-7695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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